

What is claimed is:

1. An ink jet printer including a print head having M nozzles, where M is an integer equal to or larger than 2, the print head capable of simultaneously printing M dots at a predetermined nozzle pitch in a direction along a Y axis, assuming that two axes orthogonal to each other on a two-dimensional rectangular coordinate system are set to an X axis and the Y axis, respectively, the ink jet printer printing a print image on a print medium while feeding the print medium in a direction along the X axis, by causing relative scan of the print head in the direction along the X axis and in the direction along the Y axis, relative to the print medium,

the ink jet printer comprising:

print image width-determining means for determining a print image width defined as a width of the print image in the direction along the Y axis;

head moving pitch-setting means for setting a head moving pitch in the relative scan in the direction along the Y axis, based on the print image width;

X-axis relative scan means for causing the relative scan of the print head in the direction along the X axis relative to the print medium, thereby causing printing of maximum M dot lines extending in the direction along the X axis arranged side by side in the Y-axis direction; and

Y-axis relative scan means for causing the relative scan of the print head in the direction along the Y axis, by moving the print head relative to the print medium at the head moving pitch, after printing by the relative scan of the print head in the direction

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along the X axis.

2. An ink jet printer according to claim 1, wherein said head moving pitch-setting means includes head moving pitch-determining means for determining the head moving pitch in the direction along the Y axis according to the print image width.

3. An ink jet printer according to Claim 2, wherein said head moving pitch-determining means determines the head moving pitch by looking up tables of printing dot numbers corresponding to respective combinations of each of consecutive integers representative of respective ones of the M nozzles and each of integers representative of respective positions in order of printing passes in a sequence of the printing passes, the tables being prepared for respective values of the head moving pitch.

4. An ink jet printer according to claim 1, wherein said head moving pitch-setting means includes print width-comparing means for comparing a unitary printable width determined based on a nozzle array length corresponding to a distance between ones of the M nozzles of the print head at respective opposite ends of an array of the nozzles, and the print image width.

5. An ink jet printer according to claim 1, wherein said head moving pitch-setting means includes print resolution-dependent adjusting means for adjusting the head moving pitch based on relationship between the nozzle pitch of the print head and a resolution of the print image.

6. An ink jet printer according to claim 1, further including print image storage means for storing print image data representing said print image.

7. An ink jet printer according to claim 1,

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further including print medium width-detecting means for detecting a width of the print medium in the direction along the Y axis as a print medium width.

8. An ink jet printer according to claim 1, wherein the print medium is a continuous one, and is mounted in the ink jet printer such that a direction along a length thereof coincides with the direction along the X axis.

9. A printing method for an ink jet printer including a print head having M nozzles, where M is an integer equal to or larger than 2, the print head capable of simultaneously printing M dots at a predetermined nozzle pitch in a direction along a Y axis, assuming that two axes orthogonal to each other on a two-dimensional rectangular coordinate system are set to an X axis and the Y axis, respectively, the ink jet printer printing a print image on a print medium while feeding the print medium in a direction along the X axis, by causing relative scan of the print head in the direction along the X axis and in the direction along the Y axis, relative to the print medium,

the printing method comprising the steps of:

determining a print image width defined as a width of the print image in the direction along the Y axis;

setting a head moving pitch in the relative scan in the direction along the Y axis, based on the print image width;

causing the relative scan of the print head in the direction along the X axis relative to the print medium, thereby printing maximum M dot lines extending in the direction along the X axis arranged side by side in the Y-axis direction; and

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causing the relative scan of the print head in the direction along the Y axis, by moving the print head relative to the print medium at the head moving pitch, after printing by the relative scan of the print head in the direction along the X axis.

10. A printing method according to claim 9, wherein the step of setting a head moving pitch includes determining the head moving pitch according to the print image width.

11. A printing method according to claim 10, wherein the head moving pitch is determined by looking up tables of printing dot numbers corresponding to respective combinations of each of consecutive integers representative of respective ones of the M nozzles and each of integers representative of respective positions in order of printing passes in a sequence of the printing passes, the tables being prepared for respective values of the head moving pitch.

12. A printing method according to claim 9, wherein the step of setting a head moving pitch includes comparing a unitary printable width determined based on a nozzle array length corresponding to a distance between ones of the M nozzles of the print head at respective opposite ends of an array of the nozzles, and the print image width.

13. A printing method according to claim 9, wherein the step of setting a head moving pitch includes adjusting the head moving pitch based on relationship between the nozzle pitch of the print head and a resolution of the print image.

14. A printing method according to claim 9, further including the step of storing print image data representing said print image.

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15. A printing method according to claim 9, further including the step of detecting a width of the print medium in the direction along the Y axis as a print medium width.

16. A printing method according to claim 9, wherein the print medium is a continuous one, and is mounted in the ink jet printer such that a direction along a length thereof coincides with the direction along the X axis.

17. An ink jet printer including a print head having a plurality of nozzles arranged side by side in a direction along a Y axis, assuming that two axes orthogonal to each other on a two-dimensional rectangular coordinate system are set to an X axis and the Y axis, respectively, the ink jet printer printing a unitary print image a plurality of times on a print medium while feeding the print medium in a direction along the X axis, by causing relative scan of the print head in the direction along the X axis and in the direction along the Y axis, relative to the print medium,

the ink jet printer comprising:

odd number-time printing operation means for performing each odd number-time printing operation out of the plurality of printing operations, by causing the relative scan of the print head relative to the print medium in a predetermined print area in which the relative scan of the print head is to be effected for printing the unitary print image, such that the print head starts from a starting point of a predetermined scanning path and reaches an end point of the predetermined scanning path;

even number-time printing operation means for

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performing even number-time printing operation out of the plurality of printing operations, by causing the relative scan of the print head relative to the print medium in the predetermined print area such that the print head starts from the end point of the predetermined scanning path and reaches the starting point of the predetermined scanning path; and

print medium-feeding means for feeding the print medium in the direction along the X axis by an amount of the unitary print image after the odd number-time printing operation or the even number-time printing operation.

18. An ink jet printer according to claim 17, wherein the print medium is in a continuous form, and is mounted in the ink jet printer such that a direction along a length of the print medium coincides with the direction along the X axis.

19. An ink jet printer according to claim 18, wherein the unitary print image is formed by arranging N copies, where N is an integer, of a print image represented by a print image data prepared in advance, side by side in the direction along the X axis with respect to the print medium.

20. An ink jet printer according to claim 19, wherein the print image is formed by a matrix of J dots in the direction along the X axis by K dots in the direction along the Y axis, where J is an integer equal to or larger than 2 and K is an integer equal to or larger than 2,

the ink jet printer further comprising:

line data-receiving means for sequentially receiving line data items of the print image data, each representing one line of the J dots arranged in the

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direction along the X axis, in parallel with or prior to a first one of the plurality of printing operations, according to a predetermined communication protocol from a predetermined other end of communication, thereby sequentially receiving K line data items corresponding to K lines in the direction along the Y axis; and

long line data-forming means for setting a k-th line data item (k is an arbitrary integer defined as $1 \leq k \leq K$) of the K line data items to a k-th short line data item when the k-th line data item is received, and sequentially arranging N copies of the k-th short line data item side by side to form a k-th long line data item representing one line of $J \times N$ dots formed by arranging N lines of the J dots in the direction along the X axis;

wherein in the odd number-time printing operation or the even number-time printing operation, printing is performed such that the one line of $J \times N$ dots represented by the k-th long line data item is printed as a k-th line on the print medium in the direction along the X axis thereof.

21. An image printing system comprising:

an ink jet printer including a print head having a plurality of nozzles arranged side by side in a direction along a Y axis, assuming that two axes orthogonal to each other on a two-dimensional rectangular coordinate system are set to an X axis and the Y axis, respectively, the ink jet printer printing a unitary print image a plurality of times on a print medium which is in a continuous form and is mounted in the ink jet printer such that a direction along a length of the print medium coincides with a direction

along the X axis, while feeding the print medium in the direction along the X axis, by causing relative scan of the print head in the direction along the X axis and in the direction along the Y axis, relative to the print medium, the unitary print image being formed by arranging N copies, where N is an integer, of a print image side by side in the direction along the X axis with respect to the print medium, the print image being represented by a print image data formed by a matrix of J dots in the direction along the X axis by K dots in the direction along the Y axis, where J is an integer equal to or larger than 2 and K is an integer equal to or larger than 2, and prepared in advance,

said ink jet printer comprising:

odd number-time printing operation means for performing each odd number-time printing operation out of the plurality of printing operations, by causing the relative scan of the print head relative to the print medium in a predetermined print area in which the relative scan of the print head is to be effected for printing the unitary print image, such that the print head starts from a starting point of a predetermined scanning path and reaches an end point of the predetermined scanning path,

even number-time printing operation means for performing even number-time printing operation out of the plurality of printing operations, by causing the relative scan of the print head relative to the print medium in the predetermined print area such that the print head starts from the end point of the predetermined scanning path and reaches the starting point of the predetermined scanning path,

print medium-feeding means for feeding the print

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medium in the direction along the X axis by an amount of the unitary print image after the odd number-time printing operation or the even number-time printing operation,

line data-receiving means for sequentially receiving line data items of the print image data, each representing one line of the J dots arranged in the direction along the X axis, in parallel with or prior to a first one of the plurality of printing operations, according to a predetermined communication protocol from a predetermined other end of communication, thereby sequentially receiving K line data items corresponding to K lines in the direction along the Y axis, and

long line data-forming means for setting a k-th line data item (k is an arbitrary integer defined as $1 \leq k \leq K$) of the K line data items to a k-th short line data item when the k-th line data item is received, and sequentially arranging N copies of the k-th short line data item side by side to form a k-th long line data item representing one line of $J \times N$ dots formed by arranging N lines of the J dots in the direction along the X axis,

wherein in the odd number-time printing operation or the even number-time printing operation, printing is performed such that the one line of $J \times N$ dots represented by the k-th long line data item is printed as a k-th line on the print medium in the direction along the X axis thereof;

print image forming means for forming the print image data;

print image communication means for sequentially sending the K line data out of the formed print image

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data;, and

a first interface for enabling communication between said print image communication means and said line data-receiving means.

22. An image printing system according to claim 21, wherein said first interface enables communication in conformity to an interface standard of RS-232C, USB, or IEEE1394.

23. An image printing system according to claim 21, wherein the first interface enables communication in conformity to the Centronics standard.

24. An image printing system according to claim 21, further including a second interface enabling transmission of the print image data; and

wherein said print image communication means includes:

image data-transmitting means for transmitting the print image data via said second interface;

data dividing means for receiving the print image data via the second interface and dividing the print image data into the K line data items; and

line data transmitting means for sequentially transmitting the divided K line data items one by one via the first interface.

25. An image printing system according to claim 24, wherein said second interface enables communication via a predetermined network.

26. An image printing system according to claim 25, wherein the predetermined network includes the Internet.

27. An image printing system according to claim 25, wherein the predetermined network includes a predetermined local area network.

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28. An image printing system according to claim 24, wherein the second interface enables communication in conformity to an IEEE standard LAN-based communication protocol.

29. An image printing system according to claim 24, wherein the second interface enables communication in conformity to at least one of data link protocols of an Ethernet, an FDDI, and an ATM.

30. A printing method for an ink jet printer including a print head having a plurality of nozzles arranged side by side in a direction along a Y axis, assuming that two axes orthogonal to each other on a two-dimensional rectangular coordinate system are set to an X axis and the Y axis, respectively, the ink jet printer printing a unitary print image a plurality of times on a print medium while feeding the print medium in a direction along the X axis, by causing relative scan of the print head in the direction along the X axis and in the direction along the Y axis, relative to the print medium,

the printing method comprising the steps of:

performing each odd number-time printing operation out of the plurality of printing operations, by causing the relative scan of the print head relative to the print medium in a predetermined print area in which the relative scan of the print head is to be effected for printing the unitary print image, such that the print head starts from a starting point of a predetermined scanning path and reaches an end point of the predetermined scanning path;

performing even number-time printing operation out of the plurality of printing operations, by causing the relative scan of the print head relative to the

print medium in the predetermined print area such that the print head starts from the end point of the predetermined scanning path and reaches the starting point of the predetermined scanning path; and

feeding the print medium in the direction along the X axis by an amount of the unitary print image after the odd number-time printing operation or the even number-time printing operation.

31. A printing method according to claim 30, wherein the print medium is in a continuous form, and is mounted in the ink jet printer such that a direction along a length of the print medium coincides with the direction along the X axis.

32. A printing method according to claim 31, wherein the unitary print image is formed by arranging N copies, where N is an integer, of a print image represented by a print image data prepared in advance, side by side in the direction along the X axis with respect to the print medium.

33. A printing method according to claim 32, wherein the print image is formed by a matrix of J dots in the direction along the X axis by K dots in the direction along the Y axis, where J is an integer equal to or larger than 2 and K is an integer equal to or larger than 2,

the printing method further comprising the steps of:

sequentially receiving line data items of the print image data, each representing one line of the J dots arranged in the direction along the X axis, in parallel with or prior to a first one of the plurality of printing operations, according to a predetermined communication protocol from a predetermined other end

of communication, thereby sequentially receiving K line data items corresponding to K lines in the direction along the Y axis; and

setting a k-th line data item (k is an arbitrary integer defined as $1 \leq k \leq K$) of the K line data items to a k-th short line data item when the k-th line data item is received, and sequentially arranging N copies of the k-th short line data item side by side to form a k-th long line data item representing one line of $J \times N$ dots formed by arranging N lines of the J dots in the direction along the X axis;

wherein in the odd number-time printing operation or the even number-time printing operation, printing is performed such that the one line of $J \times N$ dots represented by the k-th long line data item is printed as a k-th line on the print medium in the direction along the X axis thereof.

34. A printing method for an image printing system incorporating an ink jet printer, comprising the steps of:

forming print image data representing a print image and formed by a matrix of J dots in a direction along an X axis by K dots in a direction along a Y axis, where J is an integer equal to or larger than 2 and K is an integer equal to or larger than 2, assuming that two axes orthogonal to each other on a two-dimensional rectangular coordinate system are set to the axis and the Y axis;

transmitting K line data items of the formed print image data sequentially via a first interface; and

printing a unitary print image a plurality of times on a print medium which is in a continuous form

and is mounted in the ink jet printer such that a direction along a length of the print medium coincides with the direction along the X axis, while feeding the print medium in the direction along the X axis, by causing relative scan of a print head having a plurality of nozzles arranged side by side in the direction along the Y axis, in the direction along the X axis and in the direction along the Y axis, relative to the print medium, the unitary print image being formed by arranging N copies, where N is an integer, of a print image side by side in the direction along the X axis with respect to the print medium,

the step of printing a unitary print image a plurality of times, including:

sequentially receiving line data items of the print image data, each representing one line of the J dots arranged in the direction along the X axis, in parallel with or prior to a first one of the plurality of printing operations, according to a predetermined communication protocol from a predetermined other end of communication, thereby sequentially receiving K line data items corresponding to K lines in the direction along the Y axis, and

setting a k-th line data item (k is an arbitrary integer defined as $1 \leq k \leq K$) of the K line data items to a k-th short line data item when the k-th line data item is received, and sequentially arranging N copies of the k-th short line data item side by side to form a k-th long line data item representing one line of J x N dots formed by arranging N lines of the J dots in the direction along the X axis,

performing each odd number-time printing operation out of the plurality of printing operations,

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by causing the relative scan of the print head relative to the print medium in a predetermined print area in which the relative scan of the print head is to be effected for printing the unitary print image, such that the print head starts from a starting point of a predetermined scanning path and reaches an end point of the predetermined scanning path, such that the one line of $J \times N$ dots represented by the k -th long line data item is printed as a k -th line on the print medium in the direction along the X axis thereof,

performing even number-time printing operation out of the plurality of printing operations, by causing the relative scan of the print head relative to the print medium in the predetermined print area such that the print head starts from the end point of the predetermined scanning path and reaches the starting point of the predetermined scanning path, such that the one line of $J \times N$ dots represented by the k -th long line data item is printed as the k -th line on the print medium in the direction along the X axis thereof, and

feeding the print medium in the direction along the X axis by an amount of the unitary print image, after the odd number-time printing operation or the even number-time printing operation.

35. A printing method according to claim 34, wherein said first interface enables communication in conformity to an interface standard of RS-232C, USB, or IEEE1394.

36. A printing method according to claim 34, wherein the first interface enables communication in conformity to the Centronics standard.

37. A printing method according to claim 34, wherein the step of transmitting K line data includes:

transmitting the print image data via a second interface;

receiving the print image data via the second interface and dividing the print image data into the K line data items; and

sequentially transmitting the divided K line data items one by one via the first interface.

38. A printing method according to claim 37, wherein said second interface enables communication via a predetermined network.

39. A printing method according to claim 38, wherein the predetermined network includes the Internet.

40. A printing method according to claim 38, wherein the predetermined network includes a predetermined local area network.

41. A printing method according to claim 37, wherein said second interface enables communication in conformity to an IEEE standard LAN-based communication protocol.

42. A printing method according to claim 37, wherein the second interface enables communication in conformity to at least one of data link protocols of an Ethernet, an FDDI, and an ATM.

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